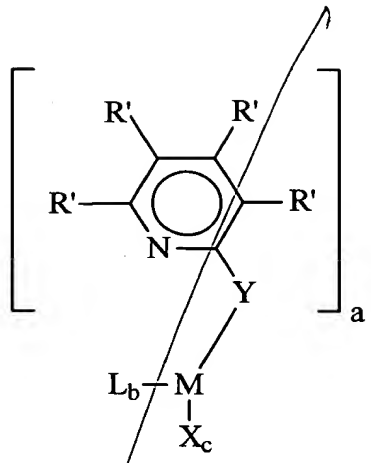
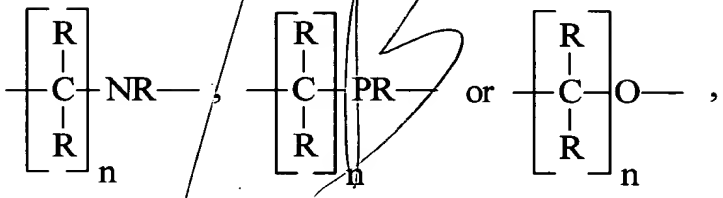


where Y is -O-, -S-,  , -P-,

Q3

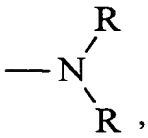


where each R is independently hydrogen, C_{1-6} alkyl, or C_{6-14} aryl;

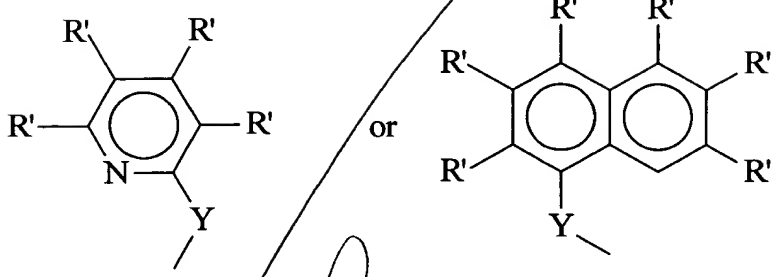
where each R' is independently R, C_{1-6} alkoxy, C_{7-20} alkaryl, C_{7-20} aralkyl, halogen, or CF_3;

where M is a Group 3 to 10 metal;

where each X is independently halogen, C_{1-6} alkyl, C_{6-14} aryl, C_{7-20} alkaryl, C_{7-20} aralkyl, C_{1-6} alkoxy, or



L is X, cyclopentadienyl, C_{1-16} alkyl-substituted cyclopentadienyl, fluorenyl, indenyl, or



where n is an integer from 1 to 4;

a is an integer from 1 to 3;

b is an integer from 0 to 2;

the sum of a+b≤3;

c is an integer from 1 to 6; and

the sum a+b+c equals the oxidation state of M.

22. The catalyst of claim 21, wherein the sum a+b≤2 when the oxidation state of M is 4 or less and a+b≤3 when the oxidation state of M is greater than 4.

23. The catalyst of claim 21, wherein Y is -O-.

24. The catalyst of claim 21, wherein X is halogen.

25. The catalyst of claim 21, wherein X is Cl.

26. The catalyst of claim 21, wherein M is a Group 3 to 7 metal.

27. The catalyst of claim 21, wherein M is a Group 4, 5, or 6 metal.

28. The catalyst of claim 21, wherein M is titanium, zirconium, or hafnium.

29. The catalyst of claim 23, wherein M is titanium, zirconium, or hafnium.

30. The catalyst of claim 25, wherein M is titanium, zirconium, or hafnium.

31. A catalyst composition useful for the polymerization of olefins, comprising a catalyst of claim ~~21~~ 71 and an activating co-catalyst.

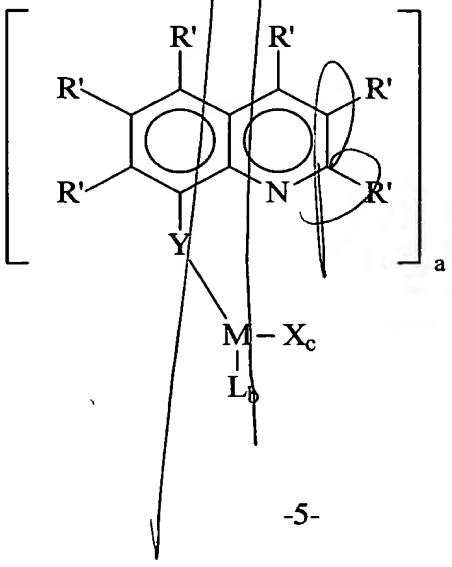
32. The catalyst composition of claim 31, wherein said co-catalyst comprises an alumoxane or an aluminum alkyl.

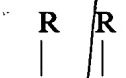
33. The catalyst composition of claim 32, wherein said alumoxane comprises (poly)methylalumoxane, ethylalumoxane, or diisobutylalumoxane.

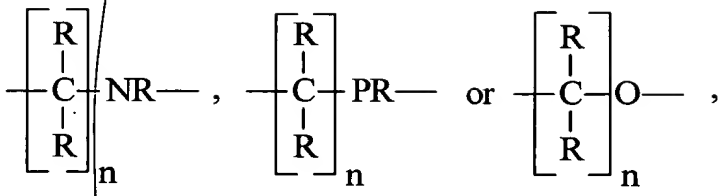
34. The catalyst composition of claim 31, wherein said co-catalyst is an acid salt containing a non-coordinating inert anion.

35. The catalyst composition of claim 31, wherein said catalyst is a catalyst in which M is Ti, Zr, or Hf; X is halogen; and Y is oxygen.

36. A catalyst composition suitable for the polymerization of olefins, comprising an activating co-catalyst and a catalyst of the formula:



where Y is -O-, -S-,  , -P-,

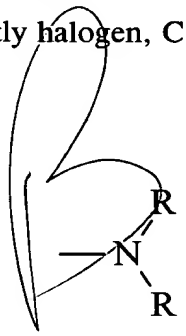


where each R is independently hydrogen, C_{1-6} alkyl, or C_{6-14} aryl;

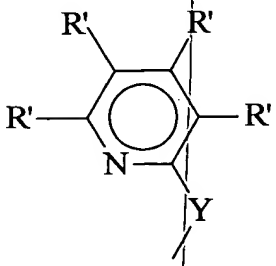
where each R' is independently R, C_{1-6} alkoxy, C_{7-20} alkaryl, C_{7-20} aralkyl, halogen, or CF_3;

where M is a Group 3 to 10 metal;

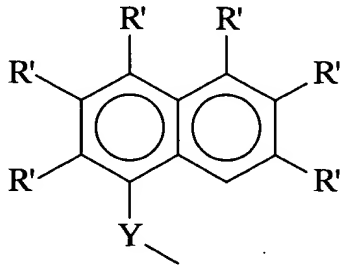
where each X is independently halogen, C_{1-6} alkyl, C_{6-14} aryl, C_{7-20} alkaryl, C_{7-20} aralkyl, C_{1-6} alkoxy, or



L is X, cyclopentadienyl, C_{1-16} alkyl-substituted cyclopentadienyl, fluorenyl, indenyl,



or



where n is an integer from 1 to 4;

a is an integer from 1 to 3;

b is an integer from 0 to 2;
the sum of a+b≤3;
c is an integer from 1 to 6; and
the sum a+b+c equals the oxidation state of M.

37. The catalyst composition of claim 36, wherein Y is -O-.

38. The catalyst composition of claim 36, wherein X is halogen.

39. The catalyst composition of claim 36, wherein X is C1.

40. The catalyst composition of claim 36, wherein M is a Group 3 to 7 metal.

41. The catalyst composition of claim 36, wherein M is a Group 4, 5, or 6 metal.

42. The catalyst composition of claim 36, wherein M is titanium, zirconium, or hafnium.

43. The catalyst composition of claim 37, wherein M is titanium, zirconium, or hafnium.

44. The catalyst composition of claim 39, wherein M is titanium, zirconium, or hafnium.

45. The catalyst composition of claim 36, wherein M is Ti, Y is -O-, X is C1, and L is C_{7-20} aralkyl.

46. The catalyst composition of claim 36, wherein said co-catalyst comprises an alumoxane or an aluminum alkyl.

47. The catalyst composition of claim 46, wherein said alumoxane comprises (poly)methylalumoxane, ethylalumoxane, or diisobutylalumoxane.

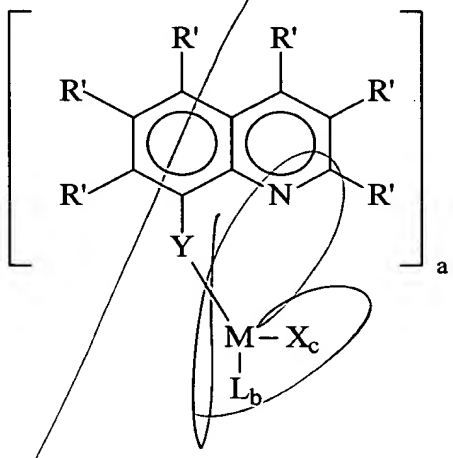
48. The catalyst composition of claim 36, wherein said co-catalyst is an acid salt containing a non-coordinating inert anion.

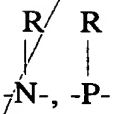
49. The catalyst composition of claim 36, wherein said catalyst is a catalyst in which M is Ti, Zr, or Hf; X is halogen; and Y is oxygen.

50. The catalyst composition of claim 45, wherein said co-catalyst comprises an alumoxane or an aluminum alkyl.

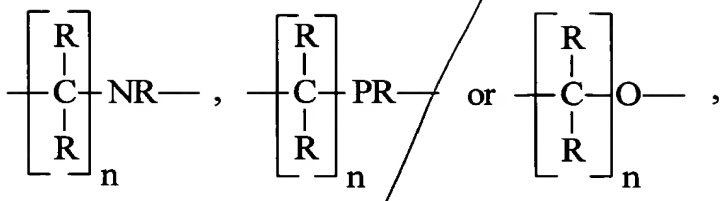
51. The catalyst composition of claim 45, wherein said co-catalyst is an acid salt containing a non-coordinating inert anion.

52. A catalyst comprising units of the formula:





where Y is -O-, -S-, -N-, -P-,

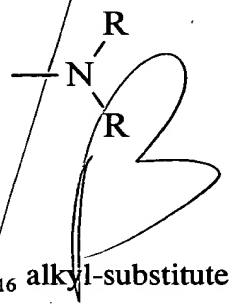


where each R is independently hydrogen, C_{1-6} alkyl, or C_{6-14} aryl;

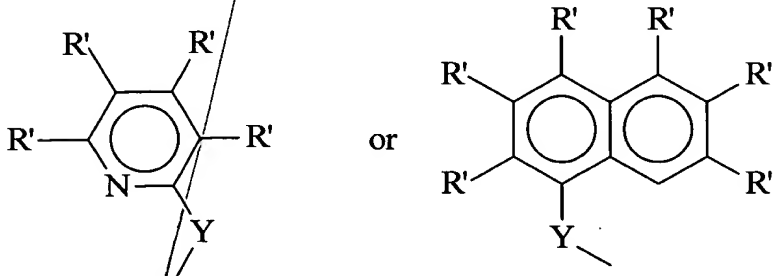
where each R' is independently R, C_{1-6} alkoxy, C_{7-20} alkaryl, C_{7-20} aralkyl, halogen, or CF_3;

where M is a Group 3 to 10 metal;

where each X is independently halogen, C_{1-6} alkyl, C_{6-14} aryl, C_{7-20} alkaryl, C_{7-20} aralkyl, C_{1-6} alkoxy, or



L is X, cyclopentadienyl, C_{1-16} alkyl-substituted cyclopentadienyl, fluorenyl, indenyl,



where n is an integer from 1 to 4;

a is an integer from 1 to 3;

b is an integer from 0 to 2;

the sum of a+b≤3;

c is an integer from 1 to 6; and

the sum a+b+c equals the oxidation state of M.

with the proviso that trichlorotitanium 8-quinolinate, dichlorotitanium bis(8-quinolinate), and monochlorotitanium tris(8-quinolinate) are excluded.

53. In a process for the polymerization of olefins in the presence of an olefin polymerization catalyst, the improvement comprising:

selecting as said olefin polymerization catalyst an olefin polymerization catalyst comprising the catalyst of claim 21.

54. In a process for the polymerization of olefins in the presence of an olefin polymerization catalyst, the improvement comprising:

selecting as said olefin polymerization catalyst an olefin polymerization catalyst comprising the catalyst of claim 23.

55. In a process for the polymerization of olefins in the presence of an olefin polymerization catalyst, the improvement comprising:

selecting as said olefin polymerization catalyst an olefin polymerization catalyst comprising the catalyst of claim 25.

56. In a process for the polymerization of olefins in the presence of an olefin polymerization catalyst, the improvement comprising:

selecting as said olefin polymerization catalyst an olefin polymerization catalyst comprising the catalyst of claim 27.

57. In a process for the polymerization of olefins in the presence of an olefin polymerization catalyst, the improvement comprising:

selecting as said olefin polymerization catalyst an olefin polymerization catalyst comprising the catalyst of claim 52.

58. In a process for the polymerization of olefins in the presence of an olefin polymerization catalyst, the improvement comprising:

selecting as said olefin polymerization catalyst an olefin polymerization catalyst comprising the catalyst composition of claim 31.

59. In a process for the polymerization of olefins in the presence of an olefin polymerization catalyst, the improvement comprising:

selecting as said olefin polymerization catalyst an olefin polymerization catalyst comprising the catalyst composition of claim 32.

60. In a process for the polymerization of olefins in the presence of an olefin polymerization catalyst, the improvement comprising:

selecting as said olefin polymerization catalyst an olefin polymerization catalyst comprising the catalyst composition of claim 33.

61. In a process for the polymerization of olefins in the presence of an olefin polymerization catalyst, the improvement comprising:

selecting as said olefin polymerization catalyst an olefin polymerization catalyst comprising the catalyst composition of claim 34.

62. In a process for the polymerization of olefins in the presence of an olefin polymerization catalyst, the improvement comprising:

selecting as said olefin polymerization catalyst an olefin polymerization catalyst comprising the catalyst composition of claim 35.

63. In a process for the polymerization of olefins in the presence of an olefin polymerization catalyst, the improvement comprising:

selecting as said olefin polymerization catalyst an olefin polymerization catalyst comprising the catalyst composition of claim 72.

64. In a process for the polymerization of olefins in the presence of an olefin polymerization catalyst, the improvement comprising:

selecting as said olefin polymerization catalyst an olefin polymerization catalyst comprising the catalyst composition of claim 37.

65. In a process for the polymerization of olefins in the presence of an olefin polymerization catalyst, the improvement comprising:

selecting as said olefin polymerization catalyst an olefin polymerization catalyst comprising the catalyst composition of claim 39.

66. In a process for the polymerization of olefins in the presence of an olefin polymerization catalyst, the improvement comprising:

selecting as said olefin polymerization catalyst an olefin polymerization catalyst comprising the catalyst composition of claim 41.

67. In a process for the polymerization of olefins in the presence of an olefin polymerization catalyst, the improvement comprising:

selecting as said olefin polymerization catalyst an olefin polymerization catalyst comprising the catalyst composition of claim 44.

68. In a process for the polymerization of olefins in the presence of an olefin polymerization catalyst, the improvement comprising:

selecting as said olefin polymerization catalyst an olefin polymerization catalyst comprising the catalyst composition of claim 45.

69. In a process for the polymerization of olefins in the presence of an olefin polymerization catalyst, the improvement comprising:

selecting as said olefin polymerization catalyst an olefin polymerization catalyst comprising the catalyst composition of claim 46.